DETERMINATION OF TOTAL SUSPENDED PARTICULATE WITH AND WITHOUT THE USE OF CONTROL FILTERS

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ABSTRACT

The use of preconditioned control filters as relative humidity correction method for total suspended particulate (TSP) mass collected on a glass-fiber hi-vol filter was investigated. The results showed that there was a difference in particulate concentrations calculated in each TSP filters with and without using the control filters, but the difference was insignificant (α = Ø.Ø1). The difference was mainly due to the hygroscopic nature of the TSP samples rather than the filters. The study suggests that the effect of relative humidity (r.h.) on glass-fiber filter can be neglected as long as the filters are equilibrated at less than or equal to 5Ø% r.h. before and after the sampling events.

INTRODUCTION

As part of the Universiti Teknologi Malaysia air quality monitoring program, a study was conducted to evaluate whether the use of preconditioned control filters for humidity correction procedure has a significant effect on the TSP mass collected on glass-fiber hi-vol filters.

Tierney and Conner (1967) had shown that the glass-fiber filter is essentially unaffected by the r.h. up to about 6Ø% and the TSP collected is essentially unaffected by r.h. up to about 5Ø%. These filters are first equilibrated before weighing at 5Ø% or less r.h. for at least 24-hr without himidity correction made. Neustadter, etal (1975) proposed the use of potentially hygroscopic filters like cellulose type filter will need r.h. correction. This is done by weighing equilibrated 3 control filters with a batch of TSP sample filters before and after the sampling events. The average change in weight of the 3 control filter (unexposed) is algebraically substrated from the change in weight of each exposed filter to give humidity corrected TSP values.

In view of the fact that the r.h. is usually higher than 50% in this region, the study on the effect of r.h. on the glass-fiber hi-vol filters need to be scrutinized.

MATERIALS & METHODS

The glass-fiber hi-vol filters used in this study was whatman EPM-2000 (20.3 x 25.4 cm). These filters were all equilibrated at less than 50% r.h. for at least 24-hr. Each batch of sample filters were weighed with 3 extra control filters (Neustadter et.al, 1975). All but the three control filters were mounted or the standard high volume air sampler operated at 1.13 m^3/min with 24 hr sampling period. A sampling frequency of once in four days was chosen. After exposure, all the filters were again equilibrated at less than 50% r.h. for at least 24-hr and weighed. All weighings were carried out on a Bosch (Model S2000) balance in an air-conditioned room. The average change in weight of the control filters were algebraically substracted from the change in weight of the sample filter to give humidity corrected TSP values.

RESULTS & DISCUSSION

Table 1 lists the r.h. corrected and uncorrected TSP concentrations for each sample filter. Based on simple t-test statistics, both values were insignificantly different at α = 0.01. This means that the r.h. correction need not be made as long as the filters are equilibrated at less than 50% r.h. before and after the sampling events. The only obvious observations made was that the corrected TSP concentration were relatively higher than the uncorrected ones. Presumably, the later should show a higher value than the former since the water absorption property of the filters has not been accounted for. This difference could only be due to the hygroscopic nature of the TSP sample (i.e. particulate) itself. A similar finding was also encountered by Tierney and Conner (1967). Heating up the post-conditioned sample filters may eliminate this effect. But since the difference was insignificant, the hygroscopic effect of the particulate on the TSP concentration can be neglected.

CONCLUSION

The effect of using the pre-conditioned control filters as r.h. correction procedure for glass-fiber hi-vol filters were discussed. No significant difference was found between the r.h. corrected and uncorrected TSP concentrations for each sample filter. Therefore the r.h. effect on the glass-fiber filters can be neglected as long as the filters are equilibrated at less than 50% r.h. before and after the sampling events.

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TABLE 1 : The Humidity Corrected and Uncorrected TSP Concentrations ($\mu g/m^3$)

Day	Uncorrected	Corrected
1	53.7	55.7
2	59.Ø	61.Ø
3	63.Ø	65.Ø
4	79.9	81.9
5	37.4	39.3
6	51.5	53.6
7	6Ø.6	62.6
8	78.9	8Ø.5
9	44.5	46.5
1Ø	52.5	54.5
11	35.6	39.Ø
12	45.4	48.8
13	5Ø.8	54.2
14	67.9	71.3
15	48.3	51.7
16	82.5	85.9
17	61.3	64.7
18	77.8	81.2
19	59.Ø	62.4
2Ø	49.6	53.Ø
21	56.Ø	58.7
22	52.2	54.8
23	81.6	84.3
24	67.2	69.8
25	6Ø.9	63.5
26	55.2	57.8
27	29.5	32.2
28	49.2	51.8
29	32.7	35.9
3Ø	61.4	64.6
31	71.1	74.4
32	69.4	72.6
33	59.5	62.8
34	73.1	76.4
35	89.3	92.5
36	3Ø.3	33.5
37	43.2	46.4
38	91.3	95.1
39	64.9	68.1
Average	58.9	61.7
std. dev.	15.8	15.9